

1. A three-dimensional faceted diamond crystal,
comprising at least one dopant element which has a greater
concentration toward or near an outermost surface of the crystal
than in the center of the crystal, wherein the concentration of the
5 dopant element is at a local minimum at least about 5 micrometers
below the surface.
2. The diamond crystal of claim 1, wherein the dopant
element is selected from the group consisting of boron, nitrogen,
10 hydrogen, lithium, nickel, cobalt, sodium, potassium, aluminum,
phosphorous, oxygen, and mixtures of any of the foregoing.
3. The diamond crystal of claim 2, wherein the dopant
element is selected from the group consisting of boron, nitrogen,
15 hydrogen, and mixtures of any of the foregoing.
4. The diamond crystal of claim 1, wherein the dopant
element is boron, aluminum, or mixtures of any of the foregoing.
- 20 5. The diamond crystal of claim 4, wherein nitrogen is
dissolved in the crystal, and wherein the concentration of nitrogen
exceeds the total concentration of dopant elements.
6. The diamond crystal of claim 5, wherein the
25 concentration of nitrogen exceeds the total concentration of
dopant elements by at least about 5 parts per million.
7. A diamond crystal according to claim 1, wherein the
dopant element is selected from the group consisting of nitrogen,
30 hydrogen, nickel, cobalt, oxygen, and mixtures of any of the
foregoing.

8 A diamond crystal according to claim 1, wherein the
dopant-element concentration within an outermost section of
about 3 to about 50 micrometers of the crystal is in an amount of
5 about 40 to about 10,000 parts per million.

9 A diamond crystal according to claim 1, wherein the
concentration of the dopant element is at a local maximum at a
distance less than about 5 micrometers from the surface of the
10 crystal.

10 A diamond crystal according to claim 1, wherein the
concentration of the dopant element causes an expansion of the
diamond lattice toward or near the outermost surface of the
15 crystal, thereby generating tangential compressive stresses at the
surface of the diamond crystal.

11 The diamond crystal of claim 10, wherein the
tangential compressive stresses are in the range of about 10 to
20 about 5000 megapascals (MPa).

12 The diamond crystal of claim 10, wherein the
generation of tangential compressive stresses increases the
compressive fracture strength of the diamond, as compared to a
25 diamond crystal in which the diamond lattice is not substantially
expanded.

13 The diamond crystal of claim 12, wherein the increase
in compressive fracture strength is at least about 2%.
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14. An article of manufacture which comprises the diamond crystal of claim 1.

15. A three-dimensional faceted diamond crystal
5 containing at least one dopant element, wherein the concentration of the dopant element is greater toward or near the outermost surface of the crystal than in the center of the crystal, said crystal being further characterized by a tangential compressive stress at a surface of said crystal of up to about 5000 megapascals.

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16. The diamond crystal of claim 15, having a diameter up to about 2 centimeters.

17. The diamond crystal of claim 15, wherein said crystal
15 is a single crystal.

18. The diamond crystal of claim 15, having one or more twin planes.

20 19. The diamond crystal of claim 15, wherein the dopant element is selected from the group consisting of boron, nitrogen, hydrogen, lithium, nickel, cobalt, sodium, potassium, aluminum, phosphorous, oxygen, and mixtures thereof.

25 20. The diamond crystal of claim 15, comprising a coated film of doped diamond about 3 to about 50 micrometers thick on an outer surface of the crystal, wherein the concentration of the dopant element in the coated film is about 40 to about 10,000

parts per million greater than the concentration of the dopant element in the outer surface of said underlying diamond crystal.

21. The diamond crystal of claim 20, wherein the dopant
5 element is diffused into the diamond crystal, and the concentration of the dopant element is about 40 to about 10,000 parts per million at a depth of about 3 micrometers to about 50 micrometers within said diamond crystal.

10 22. The diamond crystal of claim 15, wherein a range of tangential compressive stresses of about 10 to about 5000 megapascals is superimposed on preexisting tangential tensile stresses in said diamond crystal.

15 23. A method of making a diamond crystal having a tangential compressive stress on a surface up to about 5000 megapascals, comprising the step of:
growing a three-dimensional diamond crystal by a
High Temperature High Pressure process, wherein said crystal
20 includes impurities that enrich an outer surface of the crystal in a concentration that is about 40 parts per million to about 10,000 parts per million, at a depth from the outer surface of about 3 micrometers to about 50 micrometers.

24. The method of claim 23, wherein the growth temperature
25 for the diamond crystals is reduced by at least about 10°C after about 80% of the normal growth cycle is completed.